**Science 1.11** Investigate interactions between humans and micro-organisms **Internal, 4 credits**

1. *Micro-organisms* will be selected from bacteria, fungi and viruses.
2. *How humans use and are affected by micro-organisms* could include: disposal of organic wastes, sewage treatment, composting, food production and preservation, food poisoning, microbial action on everyday materials (helpful and harmful), disease in humans and animals they are in contact with, antibiotics, resistance to antibiotics, and origins and control of pandemics.
3. Biological ideasrelating to how humans use and are affected by micro-organisms are likely to include:
   * structure and life processes of micro-organisms
   * culturing of micro-organisms
   * factors that affect the life processes of micro-organisms.
4. Investigation will involve collecting information about the interactions between micro-organisms and humans. The information could come from direct observations, collection of field data, tables, graphs, resource sheets, photos, videos, websites, reference texts.
5. Definitions:

*Investigate* means describe observations or findings, and describe how humans use or are affected by micro-organisms.

*Investigate* *in depth* means using their findings and biological ideas to give a reason how or why humans use or are affected by micro-organisms.

*Comprehensively investigate* means using their findings and biological ideas to make significant links about the interactions between humans and micro-organisms, including the implication of their understanding on personal actions or everyday life. It may involve elaborating, applying, justifying, relating, evaluating, comparing and contrasting, and analysing.

**Biology 1.3** Demonstrate understanding of biological ideas relating to micro‑organisms **External, 4 credits**

1. *Micro-organisms* will be selected from bacteria, fungi and viruses.
2. *Biological ideas* relating to micro-organisms will be selected from:

* the structure of micro-organisms
* culturing of micro-organisms
* life processes of micro-organisms
* factors that affect the life processes of micro-organisms.

1. Life processesof micro-organisms will be selected from: nutrition, growth, respiration, reproduction and excretion of bacteria and fungi, and reproduction of viruses.
2. Relevant environmental factors will be selected from: temperature, oxygen availability, nutrients, moisture, chemicals (including pH, toxins, antibiotics, disinfectants) and competition.
3. The effect of environmental factors on the life processes of micro-organisms could include the following contexts: nutrient cycling and role in ecosystems, food production and preservation, sewage treatment, food poisoning, disease in plants, microbial attack on everyday materials (helpful and harmful), antibiotics, and resistance to antibiotics and genetic mutation in epidemiology.
4. The student will be expected to be familiar with the following terms: inoculate, extracellular digestion, enzyme, parasite, pathogen, toxin, decomposer, aerobic, anaerobic, hyphae, binary fission, spores, sporangium, antibiotic and vaccine.

*Demonstrate understanding* requires the student to define, use annotated diagrams, give characteristics of, or an account of microorganisms.

*Demonstrate in-depth understanding* requires the student to explain how or why something relating to microorganisms occurs.

*Demonstrate comprehensive understanding* requires the student to link biological ideas relating to micro-organisms. It may involve elaborating, applying, justifying, relating, evaluating, comparing and contrasting, or analysing.